Subject Index

A

Acenaphthene
  carbonization, 127
  determination, 29
  dehydrogenation, 127
  hydrocracking, 119
  oxidation, 120
  polymerization, 127
  properties, 26
Acenaphthylene
  determination, 29
Acepyrene
  determination, 123
Acetylene
  production from coal, 3, 4, 95
Aniline
  chlorination, 139
  determination, 59, 141, 151, 174, 175
  production, 46
  properties, 147
  synthesis, 54, 147
Anilines
  in production of plant-growth regulators, 165
  synthesis, 54
Anisole
  alkylation, 136
  isomerization, 132, 133
  production, 41
  synthesis, 135
Anthracene
  alkylation, 17
  bromination, 122
  cracking, 119
  determination, 25, 29, 123
  in dissolution of coal, 95
  hydrocracking, 119
  oxidation, 27, 28, 118, 121
  in pipewrapping tapes, 64
  production, 118
  properties, 118
  recovery, 118
  separation, 25, 118
  solvent extraction, 25
  sulphonation, 25, 28
Anthracene, Dihydro-
  cracking, 119
Anthracene, Octahydro-
  production, 27
Anthracene Oil
  in anti-corrosion coatings, 65
  determination of mercury in, 7
  in flameproof coatings, 65
  oxidation, 121
  production, 98
  in production of carbon black, 76
    of electrode pitch, 126
    of graphite, 76, 166
    of refractories, 76, 168
  in sealants, 65
  solvent extraction, 118
Anthracenes
  analysis, 29
Anthracenes – *continued*
  reduction, 28, 119, 120
Anthraquinone
  production, 27, 118
Anti-oxidants, 78
Aromatic Hydrocarbons
  acid washing, 12, 13, 24, 103
  alkylation, 17, 18, 108, 109, 121, 122
  ammination, 113
  ammoxidation, 19, 27
  analysis, 20, 28, 48, 113, 123, 124
  arylation, 110
  bromination, 122
  chlorination, 19, 112, 122
  cracking, 19, 119
  crystallization, 13, 14, 150
  dealkylation, 18, 19, 27
  desulphurization, 12, 103
  extractive distillation, 12, 104
  hydrogenation, 12, 119
  hydrorefining, 13, 103
  hydroxylation, 131
  in lubricants, 68
  oxidation, 16, 17, 26, 34, 35, 107, 108, 120, 121
  ozonolysis, 19, 120, 121
  production, 11, 13, 24, 103, 104, 105, 117
  in production of resins, 70, 159
  properties, 14, 15, 16, 25, 26, 86, 106, 107, 118, 119
  purification, 13, 24, 25, 103, 104, 105, 117
  recovery, 12, 14, 24, 103, 104, 105, 117
  reduction, 28, 120
  refining, 12, 13, 24, 103, 104, 105, 117
  separation, 13, 14, 105, 117
  solvent extraction, 13, 104
Arosolvan Process, 104
Asphalt
  ageing, 62
  analysis, 97, 127
  in building blocks, 77, 168
  in electrode binders, 167
  oxidation, 127
  in road construction, 62
  in soil brick manufacture, 168
  solvent extraction, 62
  structure, 97
  in sub-soil barriers, 168

B

Bactericides, 73, 163, 164
Benzanthracene
  determination, 30, 123, 124
Benzanthracenes
  analysis, 123
  reduction, 118, 119
Benzene
  acid washing, 11, 12, 13, 103
  alkylation, 17, 18, 108, 109, 132
  ammination, 113
  chlorination, 19
  crystallization, 13, 105
  dehydrogenation, 19

Benzene – *continued*
desulphurization, 11, 12, 103, 104
determination, 20, 113, 174, 176
electro-oxidation, 108
hydrogenation, 12, 19, 112
hydroxylation, 131, 132
oxidation, 17, 27, 35, 108, 132
ozonolysis, 19
polymerization, 70
production, 11, 13. 18, 19, 27, 44, 45, 57, 93, 103, 110, 111, 119, 149
properties, 15, 16, 106, 107, 177
recovery, 12, 13, 103, 104
reduction, 112
refining, 12, 13, 103
separation, 13, 104
solvent extraction, 13, 104
sulphonation, 36
Benzene, Ethyl-
chlorination, 112
chloromethylation, 19
crystallization, 14
determination, 20, 174
isomerization, 111
oxidation, 108
production, 110, 111
properties, 106, 107
Benzenecarboxylic Acids
oxidation, 38
production, 16, 17, 57, 107, 108, 121
Benzenes, Alkyl-
alkylation, 17, 108, 109
analysis, 20
chlorination, 19, 112
chloromethylation, 19
crystallization, 14, 105
dealkylation, 18, 19, 27, 110
disproportionation, 18, 19, 110, 111
extractive distillation, 12, 104
hydrocracking, 110
hydrodealkylation, 110
isomerization, 18, 19, 109, 110, 111, 112
in lubricants, 67
oxidation, 16, 17, 107, 108
production, 11, 17, 18, 104, 105, 106, 109, 119
properties, 14, 15, 106, 107, 177
purification, 14, 104, 105
pyrolysis, 19
recovery, 14, 104, 105, 106
separation, 13, 104, 105, 106
side-chain alkylation, 109
solvent extraction, 13, 104
sulphonation, 35, 112
transalkylation, 18, 111, 112
Benzofluoranthene
determination, 29, 30, 124
synthesis, 118
Benzole
absorption, 11
acid washing, 11, 12, 13, 103
analysis, 113
desulphurization, 11, 12, 13, 103
distillation, 11, 103
extractive distillation, 12, 13
hydrodealkylation, 13
hydrogenation, 106
hydrorefining, 13
production, 11
properties, 16, 106
purification, 11, 12
recovery, 11, 103
rectification, 11, 103
refining, 11, 12, 13, 103
Benzoperylene
determination, 124
purification, 25
synthesis, 25
Benzophenanthrene,
properties, 25, 26
synthesis, 25
Benzopyrene
determination, 29, 30, 174
synthesis, 118
Benzopyrenes
analysis, 30, 123, 124, 174
Benzoquinones
production, 45
Benzothiophen
formylation, 28
Benzothiophens
acylation, 29
bromination, 29
formylation, 29
lithiation, 29
mercuration, 29
nitration, 29
Bibenzyl
production, 132
Binaphthyl
properties, 119
Biphenyl
alkylation, 122
chlorination, 122
determination, 123
hydrogenation, 132
production, 132
reduction, 28
Biphenyls
analysis, 123
in herbicidal preparations, 72
photo-oxidation, 120
preparation, 118
production, 122
in production of plastics, 118
of synthetic fibres, 118
uses, 118
Bipyridyls
in production of bactericides, 164
of fungicides, 164
of herbicides, 164
of insecticides, 164
of stabilizers, 164
Bitumen
in adhesives, 65
air-blowing, 126, 127
as binder in briquettes, 67
in electrodes, 167
in canal lining compositions, 158
in caulking materials, 65, 157
in fire retardant compositions, 157
in flameproof coatings, 65
modification with polymers, 65
in pipecoatings, 64, 156
application, 64
with cathodic protection, 64
as road binder, 62, 65, 155
adhesion, 62
ageing, 62
emulsification, 63, 156, 157
evaporation, 62
i.r. irradiation, 62
oxygen absorption, 62
recovery, 62
testing, 155
u.v. irradiation, 62
in roofing felts, 157, 158

Bitumen – *continued*
in sealants, 65
in slurry seals, 63, 155, 156
in sound insulation materials, 65
in surface dressing, 62, 65
in waterproofing compositions, 158
Bromoxynil
herbicidal action, 72, 165

C

Carbamate Insecticides, 72
Carbazole
determination, 29, 123
properties, 55, 118, 147
purification, 54, 118
recovery, 118, 147
separation, 118, 147
Carbazoles
analysis, 29, 151
synthesis, 147
Carbolic Oil
production, 129
recovery, 129
Carbon Black
in pipewrapping tapes, 64
production, 167
in production of coke, 74
of electrodes, 75, 167
Carbon Fibre
manufacture, 76
Carbon/Hydrogen Determination, 82, 173
Carbon Materials, **73, 165**
Carboxylic Acids, Aromatic
analysis, 124
oxidation, 38
production, 16, 17, 57, 107, 108, 120, 121, 139, 160
Catechol
determination, 141
oxidation, 46
as plant growth regulator, 72
production, 131
in production of resins, 161
recovery, 129
synthesis, 131
Chrysene
determination, 123, 124
reduction, 28
Coal
analysis, 4, 5, 6, 96
in briquettes, 66
carbonization, 3, 4, 8, 93, 96
in electric arcs, 3, 4
fluid bed, 3, 93
fixed bed, 93
in microwave discharges, 4
chemical degradation, 3
coking, 5
coking behaviour, 4, 93
composition, 4, 56
de-ashing, 3, 95
delayed coking, 3
determination of germanium content, 7
dissolution, 3, 95
gasification, 3, 95
hydrocracking, 3, 94
hydrogenation, 3, 5, 8, 67, 94, 95
nitrogen content, 5
oxidation, 95
in production of acetylene, 3, 59
of activated carbon, 77
of electrode coke, 95
of liquid fuels, 67, 94
Coal – *continued*
of shaped coke, 67
of synthesis gas, 95
of termiticides, 162
pyrolysis, 3, 93
solvent extraction, 3, 95, 96
structure, 3, 4, 5, 94
thermal behaviour, 4, 96
upgrading, 3
Coal Oil
analysis, 96, 97
hydrocracking, 11, 67, 94
hydrogenation, 8, 94
hydrorefining, 11, 67
perhydrogenation, 8
production, 67, 94
in production of diesel oil, 67
of gasoline, 67
of jet fuel, 67
uses, 8
Coal Tar, High Temperature
analysis, 5, 6, 96, 97
in briquettes, 66, 158
in building blocks, 77
in canal lining compositions, 158
in caulking compositions, 157
characterization, 6
cleaning, 7, 97, 98
composition, 6, 33
determination of germanium content, 7, 97
dewatering, 7, 98
distillation, 5, 7, 8, 96, 98
in electrode binders, 75, 167
in enamels, 64, 156
application, 64, 156
hot-dipping, 64
specifications, 64, 156
in fire retardant compositions, 157
in foamed castings, 65
in fuels, 66, 67, 99
hydrocracking, 99
hydrogenation, 8, 99
injection into blast furnaces, 67
in joint sealants, 156
in mastics, 65, 156
modification with polymers, 64, 65, 156, 157
in paints, 156
perhydrogenation, 8
in pipecoatings, 63, 64, 65, 156
adhesion, 64
ageing, 64
applications, 63, 64, 156
with cathodic protection, 64, 156
specifications, 64, 156
in pipewrapping tapes, 64
production, 4, 93, 96
in production of bearings, 157
of gasoline, 99
of plastic additives, 157
recovery from emulsions, 4
in refractories, 77, 167, 168
in road binders, 61, 154, 155
adhesion, 61, 62, 155
emulsification, 63
hardening, 154
specifications, 154
stripping, 61, 155
surface dressing, 61, 155
weathering, 154
in roofing felts, 158
in sealants, 65, 66, 156
solids removal, 7, 98
in sound insulation materials, 65

Coal Tar, High Temperature – *continued*
stabilization, 7
thermal dealkylation, 75
up-grading, 75
visbreaking, 99
in waterproofing compositions, 158
in wood preservation, 71
yield from coal, 93
Coal Tar, Low Temperature
analysis, 5, 93, 96
in briquettes, 66, 67, 158
carbonization, 167
composition, 93
cracking, 99
delayed coking, 74, 165
dephenolation, 129
distillation, 5
hydrocracking, 99
hydrogenation, 99
in pipewrapping tapes, 64
production, 93
in production of carbon black, 167
of petrol, 99
in refractories, 168
in road binders, 61, 154
Coal Tar Fractions
acid washing, 13
analysis, 6, 96, 97
chlorination, 163
in coal flotation, 77
coking, 75
composition, 5, 6
delayed coking, 165
desulphurization, 12, 13
distillation, 98
extraction, 129
hydrocracking, 11, 24, 27, 94, 99
hydrodealkylation, 13
hydrogenation, 12
hydrorefining, 13
in mastics, 65
production, 93
in production of briquettes, 158
of electrode binders, 166
of fuel oil, 165
of fungicides, 163
of gasoline, 94, 99
of jet fuels, 158, 159
of lubricating oils, 159
of tar emulsions, 63
of wood preservatives, 163
in sealants, 65
thermal dealkylation, 75
upgrading, 121
utilization, 121
Coal Tar Fuels, 66, 158
COED Process, 94
Coke
determination of germanium content, 7
production, 67, 93
in production of briquettes, 66, 67
of electrodes, 3, 166, 167
of graphite, 76
of motor fuels, 94
thermal properties, 76
2,3,6-Collidine
determination, 58
2,4,6-Collidine
as corrosion inhibitor, 168
determination, 58
Collidines
analysis, 58
Column Crystallization, 90, 105
Coronene
determination, 123
Corrosion Inhibitors, 78
Coumarone
in production of resins, 70, 159
Coumarone Resins
modification with cyclopentadiene, 159
with methylmethacrylate, 68
with styrene, 63
production, 68, 159
properties, 159
Creosote
in pipewrapping tapes, 64
properties, 16
in wood preservation, **70, 162**
effect on Honey fungus, 163
effectiveness, 71, 163
for farm buildings, 71
for fencing, 71, 163
fortification with arsenic trioxide, 162
with copper/chrome/arsenic compounds, 71, 162
full-scale trials, 163
general purpose grade, 71
marine grade, 71
marine piling tests, 70, 71, 163
penetration, 70, 162, 163
performance, 70, 71
pressure treatment, 71, 163
retention, 162
Rüping process, 71
specifications, 163
testing, 71, 163
Cresol, *meta*-
alkylation, 43
bromination, 139
coloration, 34
cracking, 44
dehydroxyation, 44
disproportionation, 137
determination, 140
hydrogenation, 137
nitration, 139
production, 39, 41, 42, 130, 132, 135, 137
in production of anti-oxidants, 78
properties, 134
recovery, 130
reduction, 137
separation, 130
synthesis, 135
Cresol, *ortho*-
alkylation, 41
bromination, 139
cracking, 44
dealkylation, 44, 137
discoloration, 34, 130
disproportionation, 137
hydrogenation, 45, 137
preparation, 35
production, 41, 42, 132, 133, 135
in production of anti-oxidants, 78
properties, 134
reduction, 137
synthesis, 135
Cresol, *para*-
alkylation, 43
carboxylation, 139
coloration, 34
cracking, 44
dealkylation, 44, 137
determination, 100, 140

Cresol, *para*- – *continued*
disproportionation, 137
in hair dye preparations, 47
hydrogenation, 137
oxidative coupling, 138
production, 39, 41, 42, 132, 133, 135, 137
in production of anti-oxidants, 78
recovery, 130
reduction, 137
separation, 130
synthesis, 39, 132, 135
Cresols
acetylation, 44
alkylation, 43, 136
analysis, 48, 140, 141
biological activity, 165
colour stabilization, 34, 36
cracking, 44
dealkylation, 44, 137
decomposition, 44
discoloration, 34, 130
disproportionation, 137
hydrogenation, 45, 137
isomerization, 137
production, 17, 39, 41, 129, 132, 134, 135
in production of anti-oxidants, 78
of curing agents, 162
properties, 40, 134
recovery, 129
reduction, 137
separation, 130
synthesis, 132, 134, 135
transmethylation, 42
treatment, 34, 130
Crystallization, **89**, 90, 105, **180**, 181
Cumene
chlorination, 112
dealkylation, 110
hydroxylation, 132
oxidation, 17, 36, 37, 108
production, 108
in production of phenol, 36, 37, 131, 132
properties, 106
purification, 106
Cyclohexane
ammination, 113
determination, 113
oxidation, 131, 132
production, 12, 105, 110, 112
properties, 15, 106, 107
removal from benzene, 105
Cyclohexanol
dehydrogenation, 37, 131
oxidation, 38
production, 35
synthesis, 35
Cyclohexanone
dehydrogenation, 131
oxidation, 37, 38
production, 132, 138
Cyclohexene
ammination, 113
determinaion, 174
properties, 15
Cyclopentadiene
recovery, 11
Cyclopentadienes
in production of resins, 70
Cyclopentanes
properties, 15
Cymene
oxidation, 17

D

2,4-D
herbicidal action, 72, 165
DDT
manufacture, 72
Detergents, 73
Dielectric Constant Measurement, 177
Diphenic Acid
production, 26, 120
Diquat
herbicidal action, 72
Distillation, **88**, 89, **179**, 180
Durene
oxidation, 17, 107
properties, 15

E

Effluents
analysis, 100
biological treatment, 9, 100
countercurrent extraction, 100
degradation with ozone, 9
with potassium permanganate, 100
dephenolization, 8, 9, 99, 100
electrochemical decomposition, 8
ion exchange treatment, 8, 100
solvent extraction, 100
Enthalpimetry
apparatus, 84, 85
continuous, 84
direct injection, 84
gas, 84
precision, 85
Enthalpy Measurement, 86, 87

F

Fluoranthene
determination, 29, 123
Fluorene
arylation, 28
Fluorenones
in production of pesticides, 164
Fraass Brittle Point, 62
Fungicides, 28, 73, 163, 164

G

Gas Chromatography, 83, 84, 174, 175
alkali flame detector, 83, 174
apparatus, 83, 174
detectors, 65, 174, 175
dual column, 83
fluid, 83
high pressure, 83
large-scale, 83, 175
liquid phases, 174
open tubular, 175
pressure programmed, 175
retention data, 174, 175
solid phases, 174
Gel Permeation Chromatography, 4, 6, 83, 84, 97
Germanium
determination in tar, 7, 97

H

Halogens Determination, 82, 83, 174
H-Coal Process, 94
Heat Capacity Measurement, 86, 177

Herbicides, 72, 164
n-Hexane
  properties, 15, 107
Houdry Litol Process, 13
Hydroquinone
  determination, 141
  as plant growth regulator, 72
  production, 18, 39, 131, 138
  in production of curing agents, 162
    of pitch coke, 75
    of resins, 161
  properties, 40
  synthesis, 131, 133
HYGAS Process, 3

I

Indene
  determination, 113
  photolysis with acrylonitrile, 28
  production, 45, 149
Indenes
  in production of resins, 70, 159
  synthesis, 25
Indene-Coumarone Resins
  in adhesives, 65
  in caulking compositions, 65
  modification with cyclopentadiene, 159
    with epoxy resin, 159
    with methylmethacrylate, 68
    with rosin, 159
  production, 68, 159
  properties, 68, 159
  in road binders, 65
  in sealants, 65
  in waterproofing concrete, 159
Indole
  preparation, 147
  production, 68, 149
  properties, 55
Indoles
  hydrogenolysis, 150
  reduction, 150
  synthesis, 147
Inichar Process, 66
Insecticides, 72, 164, 165
Ioxynil
  herbicidal action, 165
Isophthalic Acid
  production, 17
Isoquinoline
  benzylation, 56
  hydrogenation, 149
  separation, 53
Isoquinolines
  in pharmaceutical preparations, 169

L

Latent Heat Measurement, 86, 177
Lepidine
  determination, 151
Light Oils, **11, 103**
  analysis, 93
  desulphurization, 13, 103
  hydrorefining, 13
  production, 73, 93, 94
Lignite
  in briquettes, 66
  carbonization, 4
    in microwave discharges, 4
  gasification, 3, 4
Lignite Coke
  production, 32, 75
  in production of electrodes, 75
Lignite Pitch
  as binder in electrodes, 75
  delayed coking, 75
  thermal cracking, 75
Liquid Fuels, **66**, 67, **158**
  production, 67, 94, 158
    from coal, 67, 94
Lubricants, **66**, 68, **158**
2,3-Lutidine
  synthesis, 146
2,4-Lutidine
  oxidation, 149
  preparation, 148
  reduction, 150
2,5-Lutidine
  preparation, 148
2,6-Lutidine
  as corrosion inhibitor, 168
  determination, 175
  oxidation, 149
  preparation, 148
  in production of polymers, 70
  reduction, 150
  separation, 52
Lutidines
  analysis, 57, 175
  oxidation, 149
  preparation, 148
  reduction, 150
  separation, 52

M

MCPA
  herbicidal action, 72, 165
Mesitylene
  oxidation, 16
  properties, 15, 107
  purification, 14
  recovery, 106
Middle Oils, **24, 117**
  hydrogenation, 8

N

Naphtha
  analysis, 20, 113
  production, 11, 94
  in production of motor fuel, 94
    of resins, 70
Naphthacene
  determination, 29
  reduction, 119
Naphthalene
  alkylation, 17, 37, 121
  bromination, 122
  chlorination, 28, 122
  crystallization, 24
  desulphurization, 117
  determination, 20, 123
  electro-oxidation, 121
  hydroxylation, 131
  oxidation, 27
    to phthalic anhydride, **68, 69, 159, 160**
  photolysis with acrylonitrile, 28
  polymerization, 123
  production, 11, 24, 27, 45, 93, 117, 119
  in production of jet fuels, 158

Naphthalene – *continued*
properties, 113, 119, 134
purification, 13, 24, 29, 117
recovery, 117
reduction, 119
refining, 13, 24, 117
separation, 24
sulphonation, 122
Naphthalenecarboxylic Acids
production, 26, 46, 120
in production of pharmaceuticals, 169
of polyesters, 161
Naphthalene Oil
dephenolation, 34
distillation, 117
fractional crystallization, 24
hydrorefining, 117
production, 98
in production of jet fuels, 158
treatment, 24, 34, 117
Naphthalene, Tetrahydro-
oxidation, 26
production, 119
Naphthalenes, Alkyl-
acetylation, 122
alkylation, 121
ammoxidation, 26
analysis, 29, 117, 123
bromination, 122
crystallization, 117, 118
dealkylation, 18, 27, 117
in dissolution of coal, 95
hydrogenation, 27
oxidation, 26, 37, 120
to phthalic anhydride, 160
production, 27, 119
in production of insecticides, 73
properties, 134
purification, 117, 118
refining, 24, 117
separation, 24, 117
1-Naphthol
carboxylation, 139
conversion to naphthoic acid, 46
degradation, 45
determination, 141
oxidative coupling, 45
production, 38, 39, 40, 121, 131
removal from effluents, 100
synthesis, 39, 40, 131
2-Naphthol
carbonation, 46
carboxylation, 139
conversion to naphthoic acid, 46
as corrosion inhibitor, 169
degradation, 45
determination, 48, 141
oxidative coupling, 45
preparation, 37
production, 131
properties, 134
synthesis, 131
Naphthols
acetylation, 44
analysis, 48, 141
in bactericidal agents, 159
carboxylation, 139
degradation, 45
in fungicidal agents, 159
oxidative coupling, 45
production, 131
properties, 134
synthesis, 131
Naphthoquinone
production, 121
in production of bactericides, 163
of fungicides, 163
Naphthoquinones
ammoxidation, 27
analysis, 29
in bactericidal preparations, 163
in fungicidal preparations, 163
preparation, 29, 121
production, 26, 27, 163
Naphthylamines
analysis, 58, 59, 151
Nicotinic Acid
production, 56
Nitrogen Determination, 82, 173, 174

O

Orcinol
synthesis, 46
Oxygen Determination, 82, 173

P

PAMCO Process, 95
Perylene
determination, 123, 124
Pesticides, **71**, 72, 73, **163**, 164, 165
Petroleum Coke
production, 74, 76
in production of electrodes, 74, 75, 76, 166
properties, 76
thermal treatment, 75
Petroleum Oil
analysis, 6, 7, 97
delayed coking, 74, 165
hydrocracking, 11, 76
in production of electrode binders, 166
of lubricating oils, 159
thermal dealkylation, 75
Petroleum Pitch
coking, 76
in production of carbon fibres, 76
of electrodes, 75
thermal treatment, 76
Pharmaceuticals, 169
Phenanthraquinone
production, 120
Phenanthrene
chlorination, 122
determination, 29
in dissolution of coal, 95
hydrocracking, 119
hydrogenation, 119
methanolysis, 120
oxidation, 26, 28, 120, 121
ozonolysis, 120
production, 118
properties, 25
purification, 25, 118
reduction, 28, 120
separation, 25, 118
Phenanthrene, Octahydro-
production, 27
Phenanthrenes
properties, 25, 26
synthesis, 25, 118

Phenanthridine
properties, 55
Phenol
acetylation, 44
alkylation, 41, 42, 43, 44, 134, 135, 136
ammonolysis, 46
arylation, 42, 44
bromination, 139
chlorination, 37, 139
condensation with acetone, 138
conversion to salicylic acid, 46
discoloration, 34, 130
electro-oxidation, 138
hydrogenation, 112, 138
oxidation, 45
oxidative coupling, 45, 138
preparation, 34, 35, 36, 37, 38, 39, 131
production, 34, 35, 36, 37, 38, 39, 44, 131, 132
in production of anti-oxidants, 78
of curing agents, 162
of pitch coke, 74
properties, 40, 134
purification, 13, 36, 37, 131
recovery, 129, 130
reduction, 112
refining, 13
removal from effluents, 8, 9, 99, 100
separation, 131
synthesis, 34, 35, 131
Phenols
acetylation, 44
alkylation, 41, 42, 43, 44, 134, 135
analysis, 47, 100, 101, 140
arylation, 44
biological activity, 165
bromination, 139
chlorination, 139
colour-stabilization, 34, 130
dealkylation, 44, 136, 137
decomposition, 100
determination, 9
hydrogenation, 45
oxidation, 45
oxidative coupling, 45, 46, 138
as plant-growth regulators, 72
production, 34, 40, 41, 129, 132
in production of bactericides, 73
of curing agents, 162
of detergents, 73
of electrical insulators, 162
of plant growth regulators, 165
of resins, 69, 161
properties, 40, 133, 134
purification, 131
recovery, 129, 130
removal from effluents, 8, 9, 99, 100
separation, 34
transalkylation, 42
treatment, 34
Phenols, Alkyl-
analysis, 47, 140
chlorination, 139
colour-stabilization, 34
cracking, 44, 138
dealkylation, 44, 136, 137
discoloration, 34, 130
disproportionation, 137
hydrogenation, 45, 137
isomerization, 44, 137
oxidation, 45, 46
oxidative coupling, 46
preparation, 133
Phenols, Alkyl- *continued*
production, 39, 40, 41, 43, 44, 129, 132, 133, 134, 135, 136
in production of anti-oxidants, 78
of bactericides, 72
of herbicides, 72
of resins, 69, 162
properties, 40, 134
purification, 42, 43, 129
recovery, 34, 129
reduction, 137
separation, 34, 136
synthesis, 132, 134, 135, 136
transalkylation, 42
Phenols, Dialkyl-
dealkylation, 137
production, 39, 41, 129, 135
in production of plasticizers, 162
of resins, 69, 162
purification, 136
recovery, 34, 129
separation, 34
synthesis, 39, 135
Phenols, Dihydric
analysis, 141
extraction, 129
oxidation, 46
as plant growth regulators, 72
production, 36, 38, 131, 138
in production of resins, 161
recovery, 129
separation, 129
synthesis, 131, 133
in tanning agents, 78
Phenols, Halo-
hydrolysis, 38
production, 133, 139
Phenols, Monohydric
alkylation, 41, 42, 43, 44, 134, 135, 136
analysis, 47, 140
extraction, 129
oxidation, 45
preparation, 34, 35, 37, 38, 39, 129
production, 34, 35, 36, 37, 38, 39, 134, 135, 136
in production of curing agents, 162
properties, 40
purification, 131, 136
recovery, 129
separation, 129
synthesis, 34, 35, 131, 134, 135, 136
Phenols, Phenyl-
bromination, 139
hydrogenation, 45
oxidation, 46
preparation, 42, 133
production, 136
Phthalic Anhydride
in alkyd resin manufacture, 69
hydrogenation, 160, 161
production from anthracene oil, 121
from carbazole, 121
from naphthalene, 68, 159, 160
from phenanthrene, 121
from *o*-xylene, 68, 160
purification, 160
2-Picoline
arylation, 148
condensation with benzaldehyde, 57
dealkylation, 56
hydrogenation, 149
oxidation, 149
production, 56, 145, 148
properties, 55

2-Picoline – *continued*
purification, 145
recovery, 145, 148
reduction, 150
synthesis, 53, 146, 147, 148
3-Picoline
alkylation, 148
ammonolysis, 149
electro-oxidation, 56
oxidation, 56, 57, 149
preparation, 146
production, 145, 146
purification, 52
separation, 52
synthesis, 53, 145, 146, 147
4-Picoline
arylation, 148
dehydrogenation, 148
oxidation, 56, 149
in production of insecticides, 73
reduction, 150
separation, 52
synthesis, 146, 147
Picolines
analysis, 57, 58
arylation, 148
dealkylation, 56
electro-oxidation, 56
oxidation, 56, 57, 149
properties, 55
purification, 52
separation, 52
synthesis, 53, 146
Piperidine
determination, 58
oxidation, 147
production, 149
properties, 55
synthesis, 54
Pitch
in adhesives, 65, 157
air blowing, 32, 75, 126, 166
analysis, 5, 32, 127
in anti-corrosion coatings, 156, 157
as binder in briquettes, 65, 66, 67, 158
in building blocks, 77
in carbonaceous cements, 75
in electrodes, 74, 75, 76, 126, 165, 166
in refractories, 77, 167, 168
in roads, 63, 65, 154, 156, 157
in canal lining compositions, 158
coking, 73, 74, 75, 76, 165, 166
composition, 5, 33
contact coking, 74
in caulking materials, 65, 157
delayed coking, 73, 165
determination of mercury content, 7
distillation, 75
emulsions, 156, 157
foaming, 166
hardening, 126
heat treatment, 33, 126, 166
hydrogenation, 5
in joint sealants, 65, 156
in mastics, 65, 156
mixtures with bitumen, 45, 154
with coal, 156
with polymers, 64, 65, 156
with polysulphides, 65, 156
with rubber, 156, 157
modification, 65, 154
molecular structure, 33, 127
in moulding composiitons, 65
Pitch – *continued*
oxidation, 32, 121, 126
pelletization, 32
in pipecoatings, 64, 156
chemical resistance, 156
water impermeability, 156
in pipewrapping tapes, 64
production, 32, 93, 98, 126
in production of granulated carbon, 166
properties, 33, 127
pyrolysis, 32
in roofing felts, 158
in sealants, 65, 157
solvent analysis, 33
in sound insulation materials, 65
structure, 5
thermal cracking, 32
thermal dealkylation, 75
thermal polymerization, 74
in thermoplasts, 65
in waterproofing compositions, 158
Pitch Coke
anisotropy, 166
production, 73, 74, 75, 76, 165, 166
in production of electrodes, 74, 166, 167
of graphite, 76, 166
properties, 166
structure, 166
Pitch Distillates
oxidation, 121
Plastics and Resins, **68, 159**
Polyphenylene Oxide (PPO) Resins
production, 69
Polyphenyls
analysis, 123
Proabd Refiner, 13, 24
Project Gasoline, 94
Protective Coatings, **63, 156**
Pseudocumene
alkylation, 109
properties, 107
Pyrene
arylation, 28
determination, 29, 123
oxidation, 121
ozonolysis, 121
reduction, 28, 120
Pyridine
acetylation, 149
alkylation, 148
benzylation, 56
as corrosion inhibitor, 168
determination, 57, 58, 59, 150, 151, 174, 176
in dissolution of coal, 3
hydrogenation, 57, 149
oxidation, 149
preparation, 146, 147
production, 56, 57
properties, 54, 55, 147
purification, 52, 145
recovery, 52, 145
reduction, 150
removal from effluents, 9
separation, 52, 145
synthesis, 53, 54, 145, 146, 147
Pyridine, Ethyl-
determination, 58
oxidation, 56
separation, 52
Pyridines
alkylation, 147, 148
analysis, 57, 58, 150, 151
in coolants, 78

Pyridines – *continued*
dealkylation, 55, 56
dehydrogenation, 148
distillation, 146
extraction, 145
in grease bases, 78
in hydraulic fluids, 78
hydrogenation, 57, 149, 150
in lubricants, 78
oxidation, 56, 149
ozonolysis, 57
in pharmaceutical preparations, 169
preparation, 146, 147
production, 11, 52, 56, 145, 146
in production of fungicides, 164
of herbicides, 164, 165
of polymers, 69, 70
properties, 55, 147
purification, 52, 146
recovery, 145
rectification, 53
separation, 52, 145
synthesis, 53, 54, 145, 146, 147, 149
Pyrogallol
in production of termiticides, 162
Pyromellitic Dianhydride
production, 17
Pyrroles
hydrogenation, 149
properties, 55

Q

Quinaldine
chlorination, 57
determination, 151, 175
separation, 53
Quinoline
benzylation, 56
chlorination, 57
as corrosion inhibitor, 168
determination, 151, 175
hydrogenation, 149
oxidation, 57
ozonolysis, 57
Quinolines
analysis, 150
chlorination, 57
dehydrogenation, 148
in froth-flotation agents, 168
ozonolysis, 57
preparation, 148
production, 53
in production of anthelmintics, 73
of bactericides, 73
of fungicides, 73
properties, 55
purification, 53
Quinoline, Tetrahydro-
determination, 150
in dissolution of coal, 3
separation, 150

R

Refractory Materials, 77, 167, 168
Resorcinol
arylation, 44
determination, 48, 141
as plant growth regulator, 72
production, 36, 38
Resorcinol – *continued*
in production of curing agents, 102
of resins, 161
properties, 40
Road Tar
ageing, 62, 154
emulsification, 63, 155, 156
hardening, 154
i.r. irradiation, 62
mixtures with aggregate, 61, 154
adhesion, 62, 155
binder content, 155
deformation, 61
German road trials, 154
layer thickness, 61
laying, 63
metrication, 61
mixing, 63
optimum binder content, 61
performance, 154
preparation, 63
reinforcement, 155
skidding, 61
skidding resistance, 63
specifications, 61, 154
stripping, 61, 155
surface wear, 61
texture depth, 63
wheel tracking test, 154
mixtures with pulverized fuel ash, 155
modification with bitumen, 61, 62, 63, 154
with butadiene/styrene, 62
with epoxy resins, 62
with polystyrene, 63
with polyurethanes, 62
with PVC, 61, 62, 63, 155
properties, 61
road trials, 61, 62, 155
in surface dressing, 61, 155
testing, 62, 155
production, 63, 154
rate of evaporation, 62
in slurry seals, 63, 155
specifications, 61, 154
in surface dressing
adhesion, 61, 62
bleeding, 61
British road trials, 61
German road trials, 154
precoated chippings, 154
setting rate, 61
stripping, 61
testing, 62
thermal stabilization, 154
u.v. irradiation, 62
volatility, 62
weathering, 154

S

Sevin
manufacture, 72
Slurry Seal, 63, 156
Solid Fuels, 66, 158
pressing, 158
production from brown coal, 158
from coal, 66, 158
from coke, 66, 158
from lignite, 66
from l.t. tar oils, 66
from l.t. tar pitch, 66
from pitch, 66
from semi-coke, 66

Solid Fuels – *continued*
properties, 66, 67, 158
surface coating, 65
thermal hardening, 66, 67, 158
Solvent Extraction, 13, 24, 25, **181**
Styrene
in naphthalene refining, 24
production, 110
Sulphur Determination, 173, 174
Surface Tension Measurement 87

T

Tar Acids, **34, 129**
dealkylation, 44, 45
dehydroxylation, 45
production, 27, 34, 93, 94, 98
thermal cracking, 137, 138
Tar Bases, **52, 145**
production, 93
Tar Distillates
in dissolution of coal, 3
Terephthalic Acid
production, 17, 18, 19, 107
Thermal Conductivity Measurement, 87
Thin-Layer Chromatography, 175
Thionaphthen
determination, 29
hydrogenolysis, 29
removal from benzene, 11, 103
production, 11
Thiophens
preparation, 28
Toluene
acid washing, 103
alkylation, 17, 108, 109
ammination, 113
ammoxidation, 19
autoxidation, 16
chlorination, 19, 112
dealkylation, 18, 27, 110
desulphurization, 103
determination, 20, 174
disproportionation, 18, 19, 110, 111
hydrodealkylation, 110
hydroxylation, 132
oxidation, 17, 108
photo-oxidation, 108
production, 11, 44, 45, 93, 110, 149
properties, 15, 106, 107
purification, 13, 103
recovery, 104
reduction, 112
separation, 13
side-chain alkylation, 109
solvent extraction, 13
sulphonation, 35, 112
transalkylation, 111
Toluenes
oxidation, 16, 17
production, 45

U

Udex Process, 104

V

Vapour-Liquid Equilibria, 86
Vapour Pressure Measurement, 86, 177, 178
Viscosity Measurement, 87, 177

W

Wash Oil
absorption capacity, 26
Wood Preservation, 28, **70, 162**

X

Xylene, *meta*-
alkylation, 109
crystallization, 14
hydrogenation, 106
oxidation, 16
production, 93, 111
properties, 14, 15, 106
purification, 14, 106
recovery, 14, 106
separation, 14, 105, 106
sulphonation, 36, 133
Xylene, *ortho*-
disproportionation, 18, 112
isomerization, 18, 111
oxidation to phthalic anhydride, 68, 160
production, 111, 149
properties, 15, 106
Xylene, *para*-
ammoxidation, 20
crystallization, 14, 105, 111
hydrogenation, 106
oxidation, 16, 17, 107, 108, 161
to terephthalic acid, 161
production, 111
properties, 15, 106
purification, 14, 105, 106
pyrolysis, 19
separation, 105, 106
thermal decomposition, 19
Xylenes
alkylation, 109
analysis, 20
chloromethylation, 19
dealkylation, 110
fractional crystallization, 14, 105
isomerization, 18, 111, 112
oxidation, 16, 107, 108
production, 11, 18, 19, 104, 105, 110, 111
properties, 14, 106, 107
purification, 13, 14, 105
recovery, 104, 105
reduction, 112
separation, 13, 14, 105, 106
solvent extraction, 13, 104
sulphonation, 133
Xylene-Formaldehyde Resins
in adhesives, 65
in caulking compositions, 65
in road binders, 65
in sealants, 65
2,3-Xylenol
preparation, 133
transmethylation, 42
2,4-Xylenol
dealkylation, 137
oxidative coupling, 138
production, 41, 135
synthesis, 135
transmethylation, 42
2,5-Xylenol
determination, 141
preparation, 133
production, 41, 135
synthesis, 135
transmethylation, 42

2,6-Xylenol
arylation, 44
oxidative coupling, 46, 138
production, 36, 41, 133, 135, 137
in production of PPO resins, 69
purification, 136
recovery, 34
separation, 34
synthesis, 39, 135
3,4-Xylenol
alkylation, 136
determination, 140, 141
production, 41
transmethylation, 42
3,5-Xylenol
chlorination, 139
determination, 140, 141
preparation, 133
3,2-Xylenol – *continued*
in production of insecticides, 165
of nematocides, 165
Xylenols
analysis, 48, 140, 141
biological activity, 165
dealkylation, 137
oxidative coupling, 46, 138
production, 39, 41, 133, 135, 137
in production of curing agents, 162
of plasticizers, 162
of resins, 69
recovery, 130
synthesis, 135

Z

Zone Refining, 25

Author Index

A

ABRAMOVITCH R. A., 148[24,35]
ABU-ELGHEIT M. A., 62[17]
ACZEL T., 6[21]
ADDIS R. R., 154[6]
ADELMAN A. H., 108[75]
AGROSKIN A. A., 76[134]
AHMED S. M., 5[15]
AKHUNDOV T. S., 15[33]; 106[49]
ALBERTINS R., 181[16]
ALEKSANDROV V. N., 16[48,52]
ALEKSANDROVA T. A., 77[134]
ALFARO H. J., 7[38]
ALUISE V. A., 82[2]
AMERIK B. K., 74[106]
AMSTOCK J. S., 66[39]
ANAZAWA I., 34[4,5,6,7]; 130[9]
ANDERSON E. L., 181[19]
ANDREIKOV E. I., 121[33]
ANGELINO H., 9[40]
ANSART R., 62[13]
ANWAR M. M., 181[23]
ARAFA M., 75[114]
ARPESELLA O. A., 111[133]
ARZADON L., 28[40]
ASADULLAEVA N. N., 15[33]
ASTHANA S. S., 5[14]
AUGST J., 168[117]
AVOTS A., 56[29]

B

BABAKHANOV R. A., 136[52]
BABICH E. P., 118[14]
BADARINARAYANA M. C., 17[61]
BAECHLER R. H., 71[80]
BAERBOCK J., 64[33]; 156[37]
BAKER J. M., 70[75]
BAKOWSKI S., 180[13]
BALASIEWICZ W., 151[49]
BALKE S. T., 84[13]
BALOGH V., 46[80]
BARANIECKI C., 167[105]
BARANOVA E. I., 16[49]; 107[64]
BARASSI G., 123[53]
BÄRBOCK J., 156[37]
BARNES J. R., 73[97]
BARNETT J. H., 71[83]
BARSCH H., 59[44]
BARSKII V. D., 117[5]
BARTLE K. D., 6[23]; 26[30]; 154[2]
BARTON H. J., 82[5]
BARTUSEK M., 141[68]
BASS K. C., 28[37]; 56[28]
BATCHELDER H. R., 93[5]
BAUMGARTH F., 134[98]
BAYER E., 146[5]
BECKER H.-D., 46[81]
BEDNOV V. M., 24[7]; 29[30]
BEESON J. H., 174[9]
BEHL B. A., 127[9]
BEHR E. A., 163[72]
BEIMANN W., 93[1]
BELAVINA I. G., 53[7]
BELCHER R., 173[1]
BELL W. H., 54[13]
BELLEN Z., 151[49]
BELOV K. A., 103[1]; 106[50]
BENES J., 57[34]
BENSON S. W., 86[1]
BERBER J. S., 76[118]
BEREZIN V. I., 99[23]
BERG L., 179[6]
BERKEBILE D. C., 167[107]
BEROZA M., 175[14]
BERRYMAN J. M., 119[18]
BETTENS B., 48[97]
BEUERMAN D. R., 82[3]
BHATTACHARYA R. N., 57[37]
BHATTACHARYYA A. T., 4[8]
BIMER J., 95[14,15]
BIRKOFER L., 96[22]
BLASIAK E., 57[31]
BLAUSTEIN B. D., 4[7]
BOGOYAVLENSKII V. V., 74[110]
BOLTON A. P., 112[125]
BOLZA E., 163[79]
BONOLI L., 107[61]
BOSSHARD H. H., 70[74]
BOWMAN M. C., 175[14]
BOYADZHIEV L., 9[40]
BRANT V. L., 95[13]
BRAUN W. G., 107[59]
BRAY V., 163[75]
BREITMAIER E., 146[5]
BRIGGS D. K. H., 62[10,11]
BROOK A. J. W., 40[46]
BROSENS J. R., 179[3]
BROWN M. W., 85[21]
BRUK A. Yu., 140[79,80]
BUCHHOLZ H., 61[4]
BUDDRUS J., 25[19]
BURD S. D., 107[59]
BURDELL C. A., 71[83]
BURMAN L. K., 180[14]
BURYAKOVA E. P., 5[18]
BUTLER J. B., 106[58]
BUTLER J. D., 54[11]
BÜTTNER W., 20[99]
BUU-HOI N. P., 29[43]

C

CAGNIANT D., 25[16]
CALLIGHAN R. H., 121[34]
CAMERA V., 123[53]
CAMPBELL A. D., 175[21]
CAMPBELL A. N., 106[48]
CARBERRY J. J., 159[48]
CARBONE W. E., 93[1]
CARDELLO R. A., 67[53]
CARRICK W. L., 45[78]
CASASSAS E., 59[49]
CASELLATO F., 53[5]
CASU B., 53[5]

CHAKRABARTI P. M., 29[43]
CHASSET R., 48[96]
CHATOT G., 123[84]
CHATTERJEE R. M., 106[48]
CHAUVIN R., 6[88]
CHEKMAREVA I. B., 57[98]
CHERNYSHEV A. K., 113[141]
CHERRY P. B., 64[88]
CHERVINSKII K. A., 16[49,51]; 107[94]
CHICHE P., 166[96]
CHIKRYZOVA E. G., 47[90]
CHISTOZVONOVA O. S., 25[15]
CHISTYAKOV A. N., 121[36,37]
CHIU K. K., 148[26]
CHMIELEWSKI J., 77[136]
CHOVIN P., 20[109]
CHRISTOF H. W., 100[39]
CHROMY V., 48[100]
CLARKE K., 29[44,46]
CLARKE P. T., 55[84]
COHEN I. C., 101[52]
COLVER C. P., 87[8,9]
COMBERIATI J. R., 93[3]
CONSTANTINIDES G., 29[47]
COOK G. L., 97[87]
COOKE J. P., 83[8]
COPP J. L., 147[16]
CORBETT L. W., 62[16]
COZZI D., 151[44]
CROCKER H. P., 139[71]
CROFT J. A., 62[10]
CROMBIE D. A., 118[17]
CSICSERY S. M., 112[124]
CULMO R., 173[4]

D

DA COSTA E. W. B., 163[77]
DAGNALL R. M., 175[88]
DALLACH G., 64[38]; 156[87]
DANNELS B. F., 112[139]
DAVE S. B., 174[11]
DAVIDSON R. S., 123[50]
DEDUSENKO N. I., 9[38]
DEHAAN F. P., 109[89]
DE LA MARE P. B. D., 122[45]
DELAUBOIS C., 48[97]
DELL M. B., 166[99]
DENISOV E. T., 45[76]
DESSAU R. M., 16[46]
DEVELOTTE J., 5[17]
DIMITROV Kh., 44[71]
DIMITROVA T. S., 126[4]
DODD A., 63[80]
DOLONSKII R. J., 112[131]
DORAISWAMY L. K., 46[85]
DORRENCE S. M., 97[86]
DRAGUSIN I., 5[16]
DRESSLER M., 113[139]
DRUSHEL H. V., 7[25]
DRYDEN I. G. C., 4[13]
DUGAN G., 82[2]
DUMONT E., 175[19]
DUPLYAKIN V. K., 121[35]
DURIEZ M., 61[5,6]; 155[9]
DYDYKINA G. V., 110[110]

E

ECK J. C., 71[82]
EGGERTSEN F. T., 127[10]
EISENHAUER H. R., 9[39]
ELBERT E. I., 117[3]
ELLWOOD F., 68[61]
ELOFSON R. M., 110[99]
ERICKSON A. E., 168[116]
ERU I. I., 27[35]

F

FABBRI G., 53[8]
FARBEROV M. I., 132[23]
FARRAR G. L., 119[35]
FELLIG J., 73[97]
FERLES M., 150[37]
FIELDS E. K., 123[51]
FILIPPOVA V. I., 18[71]
FINDLAY T. J. V., 55[16]; 147[18]
FINI G. D., 83[6]
FINN R. K., 46[86]
FLEET B., 123[55]; 173[1]
FLEMING I., 149[28]
FOHL J., 16[44,45]
FOUTY R. A., 19[94]
FRANC J., 175[17]
FRANK A. J. von, 71[83]
FRENCH K. H. V., 13[15]; 113[136]
FRIEDLANDER B. I., 104[81]
FRIEDMAN H. M., 121[41]
FRIEDRICHSEN W., 160[56]
FRIESTAD H. O., 101[51]
FOGEL'ZANG E. N., 121[40]
FOLLAND B. C., 165[88]
FU Y. C., 4[7]
FUCHSMAN C. H., 139[76]
FUENTES-DUCHEMIN J., 59[49]
FUJITA T., 165[89]
FURMAN A. P., 103[8]
FURZER I. A., 89[7]
FYFE J. F., 72[90]

G

GADALLAH F. F., 110[99]
GADYATSKII V. G., 95[13]
GALLANT R. W., 90[12]; 106[46,47]; 147[17]
GAMBRO A. J., 74[102]
GANNON R. E., 95[16]
GARRIDO M. J., 156[29]
GAVRILIUC A., 5[16]
GEGELE V. G., 69[69]
GEISS F., 174[12]
GELMAN N. E., 173[5]
GERMAN N. M., 96[16]
GERSTER J. A., 179[6]
GHOSH M. K., 87[10]
GIAM C. S., 150[39]
GILL A. W., 177[5]
GIRLING G. W., 16[43]; 181[17]
GLUSHKOVA L. V., 136[53]
GLUZMAN L. D., 25[11]
GOETHALS E. J., 36[30]
GOGEL B. K., 99[93]
GOGOLEVA T. Ya., 24[3]
GOLD P. I., 86[3,4,5]; 87[6,7]; 177[6,7]; 178[8]
GOLDMAN M. R., 88[3]
GOOD W. D., 15[42]
GORBACHEV S. V., 121[40]
GORE P. H., 122[44]
GORLAS J., 9[44]
GOULD M., 99[96]
GOUW T. H., 106[53]
GRABOWICZ W., 151[51]
GRABOWSKI Z., 33[5]; 126[1]
GRAHAM S. H., 28[39]
GRANT D. A., 72[93]

GRBENIC N., 110[105]
GREEN E. H., 154[1]
GRIGORYAN V. P., 173[5]
GRUNWALD A., 9[45]
GRUSZCZYNSKI J., 77[135]
GRUZDEVA N. A., 48[102]; 140[92]
GULYAEVA G. V., 47[94]; 134[36]
GUMP B. H., 124[57]
GUNSTON W. T., 76[127]
GUSEINOV I. A., 48[101]

H

HADZIJA O., 173[3]
HAJJAR R. F., 106[51]
HANIG D., 154[6]
HANSEN C. M., 168[116]
HANSON C., 103[10]
HARIU O. H., 88[4]
HARRIS E. C., 70[76]
HARRIS M. J., 84[16]
HARTMANN C. H., 83[10]
HARVEY R. G., 28[40]; 120[26]
HASSETT N. J., 179[4]
HAUSIGK D., 3[3]; 4[11]
HAVELKOVA L., 141[88]
HAY A. S., 69[67]; 138[67]
HAYASHI S., 67[50]
HEIBA E. I., 107[67]
HELM R. V., 97[95]
HENGSTEBECK R. J., 88[3]
HENNENBERGER P., 96[21]
HENNIG G., 141[93]
HENRY J. D., 105[96]
HERIC E. L., 119[18]
HERINGTON E. F. G., 134[34,35]
HEUKELOM W., 155[6]
HIGSON H. G., 151[46]
HIGUCHI Z., 19[92]
HILDEBRAND J. H., 177[9]
HILL G. R., 11[4]; 67[51]; 99[34,35]
HIMOE A., 19[96]
HINCHLEY E. W., 63[25]
HIRAI T., 16[54]
HISSONG D. W., 15[35]
HOEHFELD G., 104[19]
HOFFMANN D., 58[41]; 150[42]
HOLZBECHER Z., 140[78]
HOOVER T. S., 105[52]
HOUSLEY S., 40[46]
HOUZIM V., 97[89]
HOWELL P. J., 107[56]
HSIEH B. C. B., 6[30]; 97[32]
HUANG C. W., 28[41]
HUANG H. H., 148[86]
HUMME G., 174[8]
HUTZINGER O., 141[87]

I

ICHIKAWA Y., 161[61]
IGARASHI Y., 14[39]
IMANOV Sh. Yu., 106[49]
INOUE S., 33[9]
IORDANOV S. D., 174[7]
ISMAILOV R. G., 136[50]
IVANOV A. M., 16[56]
IVANOV C. P., 174[7]
IVANOV V. G., 68[60]
IWAMOTO K., 118[13]
IWASHIMA S., 25[13,18]
IZAWA T., 67[50]

J

JACOB D. R., 47[89]
JACOB T. J., 47[91]
JAMISON R. H., 89[5]
JAMOULLE J., 66[46]
JANAK J., 113[139]
JARZYNSKA M., 29[49]
JASTRZEBSKI J., 34[1]
JEFCOATE C. R. E., 132[80]
JENNER L., 62[8]; 155[18]
JENNINGS R. J. S., 65[38]
JIRACEK F., 19[90]
JOHANSON R., 162[70,71]
JOHNSON A. F., 107[55]
JOHNSON D. W., 87[8,9]
JOHNSTON K. M., 138[66]
JONES D. W., 6[29]
JONES G. T., 155[19]
JORDAN J., 84[15]

K

KAEDING W. W., 108[58]
KAGAMI K., 16[55]
KAHOVEC J., 133[80]
KAINZ G., 82[1]
KAISER R., 175[20]
KALAKUTSKII B. T., 120[33]
KALOCH M., 74[108]
KAMAL I., 15[38]
KAMIYA Y., 27[88]
KAMNEVA A. I., 16[50]
KANIEWSKI E., 118[8]
KARLINSKII L. E., 11[5]
KARMEN A., 174[13]
KAROLIN K., 41[54]
KARPOV O. N., 47[93]
KARYAKINA L. N., 59[47]
KATSOBASHVILI Ya. R., 117[3]
KAY W. B., 15[35]
KAZNACHEEV A. M., 98[31]
KEAVENEY W. P., 19[95]
KEHAT E., 108[74]
KEKIN N. A., 33[7]
KELLER W., 146[8]
KELLEY J. D., 175[16]
KELUS J., 100[46]
KENYON R. S., 55[16]
KERR K. A., 119[20]
KESSLER T., 3[4]
KEUL M., 48[99]
KHEIFETS L. Ya., 47[95]
KHOMENKO V. A., 47[90]
KIIKO I. I., 120[30]
KIMMONS G. L., 168[115]
KING W. H., 62[16]
KIRWAN D. J., 90[10]
KLEVTSOVA M. I., 47[94]
KLOTZ H. D., 15[40]
KOERNER H., 72[91]
KOGAN B. E., 53[6]
KOLJKOWSKY P., 113[135]
KOL'KOVSKI P., 20[101]
KÖLLING G., 4[11]
KOLYANDR L. Ya., 11[7]; 68[56]
KONAR B. B., 77[137]
KONDRATOV V. K., 124[58]
KONISHI K., 141[86]
KOPELIOVICH L. V., 32[5]
KOPTYUG V. A., 136[49]
KORENMAN I. M., 59[46,47]
KORENMAN Ya. I., 100[41]

KORENSKII V. I., 43[61]
KOROBCHANSKII V. I., 13[18]; 107[80]
KORSHUNOV I. A., 24[9]
KOSTYUK V. A., 130[8]
KOTANIGAWA T., 137[57]
KOTSEV N., 110[106]
KOVACIC P., 132[21]; 133[29]
KOZLOV V. A., 113[133]
KRICHKO A. A., 27[31]
KROL Z., 59[48]
KROUPA J., 141[99]
KRYSIN A. P., 136[48]
KUBICKA R., 11[3]
KUDRYASHOV V. I., 32[3]
KUDRYAVTSEVA N. A., 140[84]
KUGELER K., 4[6]
KUHNEL M. R., 61[8]
KULESHOV P. Ya., 8[34]
KULIKOWSKI G., 126[1]
KULIOWSKI G., 33[6]
KULOOR N. R., 18[28]; 110[104]
KUZNETSOV E. R., 100[42]
KVAPIL Z., 11[3]

L

LADNER W. R., 83[11]
LAFAY M. R., 105[34]
LAFAY R., 14[24]
LANDA S., 149[32,33]
LANEWALA M. A., 112[135]
LANGER S. H., 40[49]; 83[9]; 112[128]
LANUM W. J., 55[33]
LAUER F. C., 100[43]
LAUNDON R. D., 54[11]
LAWRENSON I. J., 134[34,38]
LAYNE H. B., 156[23]
LAZARUS M. S., 175[15]
LEACH C. W., 71[81]
LEES G., 61[7]
LEITIS L., 56[30]; 149[29]
LEMIEUX E. J., 89[6]
LENTZ H., 180[12]
LEVI M. P., 70[77]
LEWIS G., 107[55]
LEWIS I. C., 127[7]
LIBICKOVA V., 113[140]
LIELMEZS J., 106[32]
LIKHORADOV A. P., 77[138]
LIMB G., 140[81]
LIN A., 108[74]
LIN W.-S., 20[102,103,104]
LINFORD R. G., 177[2]
LIPATOVA L. F., 29[50]
LIPOVICH V. G., 109[88]
LIST F., 69[62]
LIVERSEDGE F., 63[19]
LIVSHITS B. Ya., 166[95]
LOCKART F. J., 179[5]
LODI G., 53[6]
LOPATINSKII V. P., 147[15]
LOSKUTOVA E. N., 96[18]
LUGOVKIN B. P., 151[48]
LUKASHENKO E. E., 119[19]
LUPIEN Y., 25[14]
LUYBEN W. L., 180[15]

M

McCARTHY W. J., 175[15]
McCULLOUGH J. J., 28[41]
MACDONALD P., 64[26]
McGLASHAN M. L., 15[37]
MACKIEWICZ S., 118[8]
McLAUGHLIN E., 15[38]
McQUIRE A. J., 70[76]
MADDOX R. N., 180[14]
MALKOVA S. S., 67[52]
MALYSHEVA N. V., 26[27]
MALZ F., 9[44]
MAMEDALIEV G. M., 108[81]
MAMEDOV A. M., 15[38]
MAMEDOV A. N., 15[34]
MAPLE R. E., 129[1]
MARIICH L. I., 20[108]; 113[138]
MARKETOS D. G., 20[105]
MARKIN A., 180[11]
MARKS W., 82[4]
MASEK V., 5[19]
MASON J. B., 149[28]
MASUDA Y., 58[41]; 150[42]
MATKOVSKII K. I., 120[30]
MATO F., 55[17]
MATRKA M., 141[90]
MATSUMOTO H., 18[84,85]; 112[126]
MATSUMOTO M., 56[26]; 138[63]
MATSUMOTO Y., 58[41]
MATUSYAK N. I., 126[8]; 166[99]
MAZUMDAR B. K., 67[47]; 93[4]; 158[43]
MEAKIN C. P., 83[7]
MEDONOS V., 45[74]
MEEK W. H., 139[76]
MELOAN C. E., 82[3]
MENSCH F., 56[27]
METELITSA D. I., 45[76]
MEYERSON S., 123[51]
MIJS W. J., 138[68]
MIKHNO S. I., 103[3]
MILES K. B., 72[92]
MILLINGTON J. P., 122[48]
MILLS G. A., 94[9]
MINATO H., 123[52]
MINEVA S., 106[54]
MLEJNEK O., 48[98]
MLOCHOWSKI J., 24[5]
MOCHALOV V. V., 32[5]
MOLCHANOVA V. V., 17[64,65]
MOLINARI J. G. D., 13[17]
MOOKHERJEA S. K., 93[4]
MORALES R., 134[37]
MORIMOTO T., 16[47]
MORITA Y., 18[84,85]; 112[126]
MORRIS D., 55[23]
MORRIS J. C., 63[21]
MOSIMANN H., 140[85]
MUELLER E., 104[19]
MULLER D., 25[16]
MUNDAY J. C., 168[114]
MURAKAMI C., 130[9]
MURTAGH B. A., 88[1]
MUTO J., 118[12]
MYERS R. S., 15[39]

N

NABABSING P., 56[28]
NABIVACH V. M., 26[23]; 150[40]
NACE D. M., 19[86,87]
NAGAI S., 35[16]
NAGATA I., 107[58]
NAIR C. G. R., 47[91]
NAKAJIMA M., 165[89]
NARUKE N., 118[12]
NASH C. W., 82[5]
NAVAZIO G., 38[33]
NELSON A. L., 121[41]

NESTERENKO N., 26[21]
NEUHÄUSER S., 52[4]; 58[43]
NIEPEL U., 63[34]
NISBET M. A., 118[16]
NISENFELD A. E., 180[16]
NOVACEK J., 168[117]
NOVIKOV A. N., 120[31]
NOWAK R. M., 112[131]
NULL H. R., 179[7]
NYAREP E. Yu., 100[40]

O

OAE S., 38[34]
OELERT H. H., 4[18]
OGATA Y., 16[47]; 135[45]
OGLE G. J., 86[3,4,5]; 87[6,7]; 177[6,7]; 178[8]
OHKUBO K., 108[73]
OSBORNE L. D., 163[77]
OSA T., 108[76]
OTA E., 118[13]
OTANI S., 75[112,113]
OTT R., 25[17]

P

PAKHOMOV L. G., 24[9]
PAKTER M. K., 7[29,30]
PALMER D. A., 179[7]
PAPKOV G. I., 129[2]
PARKER V. D., 121[39]
PARKER W. D., 64[37]
PASTOUR P., 57[35]
PATS B. M., 129[2]
PATZEK T., 7[36,37]; 34[1]
PAUL R. N., 145[3]
PAULY W., 96[83]
PAUSHKIN Ya. M., 161[64]
PAWLOWSKA-MARZEC A., 20[106]
PAYS M., 151[47]
PECSAR R. E., 174[9]
PEET N. J., 93[2]
PELLERIN F., 48[96]
PENCHEV S., 106[54]
PERKAMPUS H. H., 55[20]
PESARINI C. E., 111[123]
PETERSEN J. C., 97[86]
PETERSON R. W., 166[96]
PETRENKO I. G., 18[71]
PETROVA L. N., 106[50]
PETSEV N., 44[71]
PETTIFORD L. R., 112[130]
PHADTARE P. G., 46[85]
PICHLER H., 96[80,81]
PIETROGRANDE A., 83[6]
PIGFORD R. L., 90[10]
PILYUGINA N. G., 113[134]
PIMENOVA S. I., 64[30]
PINDER R. M., 147[14]
PINES H., 122[43]; 148[23]
PLAYER M. R., 90[12]
PLIEV T. N., 43[63]; 140[83]
POGADAEV A. M., 119[19]
POLLIO F. X., 8[37]
POPLAVSKII K. L., 113[141]
POSPISIL J., 133[30]
POTASHNIKOV M. M., 53[7]
POULSON R. E., 58[42]
POULTON G. A., 148[24]
POWERS J. E., 181[18]
PRAHL W. H., 180[10]
PRASAD N. K., 5[14]
PRIBYL M., 48[100]
PRIDDY D. B., 122[43]
PRIKHOD'KO Yu. A., 113[137]
PROSKUROWSKA I., 29[49]
PULLEN J. W., 55[21]
PULSIFER A. H., 95[11]
PYKHTIN V. A., 12[9]

Q

QADER S. A., 11[4]; 67[51]; 94[8]; 99[34,35]
QUEGUINER G., 57[35]

R

RABCZUK A., 117[6]
RAHMAN A., 118[115]
RAJAGOPALAN K. S., 169[130]
RAMAKRISHNAIAH K., 169[119]
RANDOLPH A. D., 90[11]
RANG S., 19[91]
RAUDENBUSCH H., 63[18]
RAUDSEPP H. E., 44[70]; 45[73]
RAUDSEPP H. T., 41[64]; 44[70]; 45[73]
RAVINDRAM M., 18[78]; 110[104]
RECKO W. M., 15[36,41]
REID C. G., 133[29]
REMIREZ R., 74[103]
RENARD C., 72[90]
REYNEVELD N. G., 155[11]
REYNOLDS C. A., 84[16]
RIAD M. A., 24[4]
RICE R. L., 32[4]; 76[118]; 167[109]
RICKARD R. L., 147[14]
RIPPERGER W., 20[107]
ROARK J. L., 40[47]; 55[28]
ROBERTS R. M., 109[90,91]
ROBERTSON J. M., 119[20]
ROBINSON B., 150[38]
ROBINSON C. J., 97[87]
ROBINSON D. A., 155[13]
ROBINSON E. R., 88[3]
ROBINSON P. M., 118[10]; 147[30]
ROBINSON R. J., 140[81]
ROCHE E. C., 181[20]
ROCHE J. N., 70[79]
ROCHESTER C. H., 40[44,45]
RODGER A. J., 107[57]
RODRIGUEZ N. M., 118[15]
RODZIEWICZ W., 9[43]; 100[47,48]
ROGA B., 24[5]
ROGERS D. T., 168[114]
ROKHUMYAGI M. A., 11[1]
ROMOVACEK J., 16[44,45]
ROSSALL B., 40[44,45]
ROST M., 90[14]
ROUCHAUD J., 16[53]; 108[69]
RUBAC R. E., 180[9]
RUMOHR C. von, 119[22]
RUMYANTSEVA Z. A., 96[19]
RUS'YANOVA N. D., 26[37]; 121[33]; 124[38]; 160[52]

S

SADOWSKA K. W., 55[18,19]
SAFAEV A., 149[35]
SAFAEV A. S., 110[107,108,109]
SAGE R. C., 88[4]
SARATOV I. E., 26[33]
SARGENT R. W. H., 88[1]
SARTORIS N. E., 148[23]
SASTRI S. R. S., 177[1]
SATO K., 20[100]
SAVELEV N. M., 98[30]

SCHAAD R., 30[58]
SCHEIMAN A. D., 179[3]
SCHLOTZHAUER W. S., 133[88]
SCHMELTZ I., 133[88]
SCHMID B. K., 95[13]
SCHMIDT H., 154[8]
SCHMIERS H., 74[105]; 165[93]
SCHROETER S. H., 138[65]
SCHUESSLER P. W. H., 174[6]
SCHULZ H., 20[107]
SCHULZE-BENTROP R., 135[48]
SCHWARTZ M. A., 46[79]
SCHWARZ G., 96[20]
SCIORTINO T., 24[3]
SCIPIONI A., 38[32]
SCOTT H. G., 118[10]; 147[50]
SCOTTI S. J., 89[6]
SEEBOTH H., 20[98,99]
SEKINE N., 27[38]
SEMENOV V. G., 74[107]
SENOLT H., 126[5]
SEREDA L. V., 58[39]
SERGEEV B. I., 77[134]
SESHADRI D. N., 147[19]
SHABOLDO P. I., 35[13]; 132[28]
SHANKER V., 141[89]
SHAPIRO M. D., 29[46]; 95[13]
SHARIPOV A. Kh., 68[59]
SHARMA M. M., 89[8]
SHAW R., 177[4]
SHAW S., 118[17]
SHEEHAN R. J., 40[49]
SHELOUMOV V. V., 100[40]
SHEPARD A. F., 112[189]
SHEVCHUK L. G., 35[13]
SHIK V. N., 68[58]
SHILMAN Ya. M., 76[126]
SHIMANSKAYA M. V., 149[39]
SHOOP S., 63[33]
SHOPOV D. S., 16[50]
SHORT G. D., 29[51]
SIMONOV V. D., 139[70]
SINGER L. S., 127[7]
SLEBODZINSKI T., 149[31]
SMITH D. N., 71[66]
SMITH N. K., 15[43]
SMITH W. B., 40[47]; 55[28]
SMOL'YANINOVA N. M., 12[9]; 103[6]
SNYDER L. R., 6[84]; 97[84]; 97[88]; 150[43]
SOKOLOWSKA R., 100[49,50]
SOLOMKO N. I., 17[60]
SOMEKH G. S., 104[81]
SOMMERFELD J. T., 180[11]
SONDERGAM L., 108[69]
SPINK J. M., 55[24]
SPROW F. B., 67[53]
SPRYSKOV A. A., 113[133]
SRIKANTHAREDDY P., 27[32]
STAHL E., 175[19]
STANESCU G., 48[99]
STARKOV S. P., 136[53]
STEFANESCU D., 146[9]
STEWART J. T., 59[45]
STIPANOVIC B., 122[42]
STOCK L. M., 19[96]
STORCH H. H., 8[35]
STORMS P. W., 119[85]
STROM D. I., 72[95]
STUBLEY D., 107[56]
STUCKEY C. L., 20[110]
SUBRAMANYAN N., 169[119]
SULTANOV A. S., 149[24]
SUPEL R., 117[6]
SUZUKI Y., 141[91]
SVANIDZE L. K., 69[69]
SVIRIDOVA L. A., 100[41]
SYPCHENKO G. I., 11[3]
SZCZEPANIK R., 62[14]
SZUBA J., 117[1]

T

TAO L. C., 86[3]
TARAMA K., 109[82,83]
TASSIOS D., 89[9]
TAYLOR G. M., 28[37]
TAYLOR J., 99[86]
TEWORTE W., 9[41]
THIELEMANN H., 141[93]
THOMAS B. E. A., 13[17]
THOMAS D. E., 141[94]
THOMAS J. D. R., 141[94]
THOMAS W. J., 181[21]
THOMPSON J., 156[33]
TIMMINS R. S., 83[12]
TOBIAS M. A., 108[68]
TOKURA N., 28[39]
TRAXLER R. N., 62[15]
TRAYANOV B., 126[4]
TRAYNHAM J. G., 40[48]
TRIBBLE M. T., 40[46]
TRUBNIKOV V. I., 58[38]; 150[41]
TSAREVA Z. M., 103[1]
TUNIS F., 24[5]

U

UHDEOVA J., 29[46]
ULRICH H., 33[8]
UNGER M. O., 19[94]
UNSWORTH A. K., 69[63]

V

VAJDA J., 33[8]
VALLIS J. W. M., 61[3]
VERSINO B., 174[12]
VINUTHA A. R., 148[35]
VISICH E. T., 90[14]
VOGT L. H., 45[77]
VOL-EPSHTEIN A. B., 137[60]
VOLF J., 97[89]
VOLPE S., 29[47]
VRANJICAN D., 110[105]
VUDKIN B. I., 39[40]
VYAKHIREV D. A., 47[93]
VYSOTSKAYA N. A., 35[13]

W

WACHBERGER E., 82[1]
WAIN R. L., 72[94]
WALISCH W., 82[4]
WALKER J. Q., 175[16]
WALLCAVE L., 123[56]
WALSER R., 139[71]
WALTERS N. E. M., 163[79]
WATKINS R. N., 179[1]
WEBER W., 140[85]
WEI K. S., 108[75]
WEST H. J., 94[6]
WESTPHAL O., 54[13]
WHALLEY B. J. P., 5[15]
WHITE D., 159[48]

WHITE D. M., 44[66]; 69[67]
WHITE J. L., 166[97]
WIEGANDT H. F., 105[24]
WIELOPOLSKI A., 95[14,15]
WILLIAMS D. F., 25[14]
WILLIAMSON A. G., 177[3]
WILMAN W. G., 61[8]; 62[9]; 155[17]
WILSON T. D., 61[3]
WINGARD L. B., 46[86]
WISER W. H., 119[91]
WITHERSPOON P. A., 107[61]
WOLF F., 52[4]; 58[45]; 141[93]
WOYCICKI W., 55[18,19]
WRABETZ K., 151[50]
WU W. R. K., 8[35]
WURM H. J., 100[39]

Y

YABSLEY T. V., 71[88]
YAMAMOTO M., 137[87]
YOSHIDA H., 155[14,15]
YOUNG L. B., 17[59]
YOUNG R., 29[51]
YUKHNOVSKII G. L., 159[47]
YURCHAK S., 112[189]
YUSUF M., 122[44]

Z

ZAKHAROV-NARTSISSOV O. I., 113[134]
ZAMBONIN P. G., 84[15]
ZELENKIN V. G., 75[111]
ZELINSKII Yu. G., 52[1]
ZEMLYANITSKAYA E. T., 151[48]
ZHEREBTSOVA L. P., 16[51]
ZHOMOV A. K., 136[91]
ZIEBORAK K., 26[31]
ZIELINSKA E., 151[45]
ZIMINA G. M., 59[46]
ZOCCOLILLO L., 174[10]
ZUEV V. P., 76[185]

Patent Index

Australian

280205 4[10]

British

1106916 78[138]
1109422 84[17]
1118821 34[10]
1122510 3[2]
1125122 14[33]
1126139 73[96]
1139595 32[3]
710 13[14]
1140428 76[119]
464 43[59]
913 34[9]
1141238 35[12]
526 53[9]
697 73[98]
809 12[13]
1142070 36[18]
233 44[67]
287 69[68]
402 38[32]
1143589 47[88]
1144029 18[74]
067 14[37]
661 66[45]
1145699 68[54]
1146408 36[19]
456 14[26]
654 65[33]
987 17[67]
1147153 19[93]
567 18[72]
706 13[16]
725 72[98]
793 35[11]
819 70[73]
997 17[63]
1148863 108[71]
907 36[22]
1149141 54[14]
447 46[88]
452 27[33]
774 68[55]
1150034 42[56]
209 41[50]
966 73[99]
1151606 14[30]
1152079 43[58]
234 65[37]
927 75[115]
968 66[43]
1153104 12[13]
527 69[65]
528 69[66]
588 70[71]
1154250 72[89]
576 39[42]
646 67[49]
1154675 57[26]
910 62[13]
1155448 75[116]
521 75[117]
1156280 157[34]
421 17[62]
453 77[133]
456 74[109]
964 149[27]
983 157[35]
1157001 147[12]
356 112[127]
838 157[32]
1158145 158[40]
173 132[19]
365 146[4]
987 112[132]
1159220 166[102]
1160020 107[63]
300 104[17]
394 155[10]
491 41[51]
520 104[13]
547 158[37]
616 160[54]
1161046 164[85]
222 162[47]
491 165[86]
492 165[87]
848 109[95]
898 157[36]
1162254 118[9]
397 131[13]
1163034 100[38]
472 164[84]
502 162[46]
539 130[10]
540 130[11]
1164200 130[6]
267 158[38]
765 109[96]
982 108[73]
1165122 136[49]
517 156[31]
583 110[101]
637 139[75]
1166667 103[4]
925 162[48]
1167062 161[50]
263 164[83]
695 159[45]
1168283 158[41]
1169291 137[55]
786 105[35]
1171509 169[121]
825 163[81]
838 160[50]
854 131[16]
1172632 122[49]
1173405 168[111]
704 120[37]
1174034 147[13]
1174279 104[11]
385 169[132]
577 156[30]
724 105[37]
1175079 160[59]
1186494 103[7]

Canadian

803432 64[29]
810233 17[58]
636 8[36]
815064 147[14]
816197 105[40]
718 148[21]
817446 108[70]
935 105[41]
818589 109[93]
609 157[30]
828174 146[10]

Czechoslovakian

123673 78[140]
125959 37[27]
126307 11[6]
127973 85[20]
128367 34[2]
724 129[3]
129064 131[17]
864 138[61]

Dutch (Applications)

68 14836 111[121]
17615 110[113]
616 111[115]
69 03484 133[91]

French

1503280 69[44]
1504073 38[31]
1508481 165[91]
1509921 37[29]
1510250 105[33]
251 13[19]
1511357 27[30]
604 65[34]
1512328 27[28]
1514441 65[35]
1515588 37[33]
1521678 66[41]
1524345 63[23]
1525444 34[8]
1526882 105[37]
1528032 173[3]
1529149 159[44]
1531000 168[113]
287 76[130]

1 533 498 146^{6}
1 534 180 105^{48}
812 100^{44}
1 535 419 76^{133}
1 536 181 37^{30}
182 131^{12}
683 39^{39}
817 42^{55}
1 537 351 160^{55}
574 136^{54}
1 538 894 166^{100}
1 539 131 121^{38}
1 541 720 131^{14}
1 544 331 107^{66}
350 138^{64}
1 545 013 110^{103}
081 110^{102}
1 549 188 105^{24}
1 565 374 166^{101}
1 570 510 135^{44}
1 576 182 137^{56}
1 580 963 133^{27}

German (East)

59 277 66^{48}
568 56^{25}
60 047 39^{36}
606 64^{31}
62 849 7^{32}
63 492 145^{2}
494 146^{7}
64 408 100^{45}
66 615 158^{39}

German (West)

1 242 138 157^{33}
1 262 558 71^{24}
1 268 125 18^{68}
1 276 614 13^{32}
1 280 255 43^{62}
1 281 448 135^{40}
1 283 848 39^{41}
1 285 448 4^{9}
1 285 482 7^{31}
1 293 777 137^{58}
1 294 388 130^{5}
1 294 868 157^{31}
1 296 615 120^{39}
1 297 110 135^{41}
1 298 098 138^{42}
1 418 022 19^{97}
1 800 676 139^{72}
1 804 695 122^{46}
1 808 141 109^{94}
1 808 252 106^{45}
1 813 252 111^{114}
1 815 309 111^{130}
1 815 873 154^{3}
1 906 205 133^{33}
1 907 915 105^{26}

Hungarian

155 473 52^{2}
907 160^{51}

Indian

107 414 168^{118}

Japanese

68 00 053 43^{60}
12 337 41^{53}
18 765 18^{76}
20 187 52^{8}
21 413 43^{64}
752 70^{70}
22 582 18^{79}
69 00 050 18^{75}
051 18^{77}
055 44^{69}
02 700 36^{17}
04 778 160^{57}
968 135^{47}
05 860 107^{65}
06 258 104^{30}
260 103^{9}
807 109^{97}
08 036 156^{25}
09 479 156^{26}
14 333 135^{46}
17 372 132^{24}
20 738 108^{60}

Polish

54 801 12^{10}
55 032 163^{80}
439 26^{35}
707 76^{132}
804 103^{8}
805 24^{6}
56 315 66^{40}
368 118^{7}
57 075 162^{69}

Roumanian

50 623 68^{57}
976 70^{72}
51 253 17^{66}

Russian

210 831 32^{1}
847 24^{5}
211 426 105^{35}
212 241 24^{1}
213 774 12^{11}
215 214 53^{10}
915 13^{21}
220 977 11^{3}
984 129^{4}
223 240 66^{44}
975 126^{3}
224 528 133^{35}
226 451 168^{113}
576 109^{86}
228 003 167^{104}
034 7^{33}
230 776 166^{94}
233 633 77^{129}
686 37^{28}
235 294 159^{46}
764 149^{30}
236 482 130^{7}
237 857 104^{18}
238 219 140^{77}
239 967 137^{59}
242 863 106^{44}
245 729 108^{79}
246 504 159^{49}
247 305 109^{97}

South Africa

68 01 272 41^{52}
415 35^{14}
02 781 109^{95}
03 409 37^{24}
04 378 169^{123}
05 837 161^{68}
06 097 163^{82}

Spanish

345 114 103^{5}
125 117^{4}

United States

3 138 436 84^{18}
3 160 477 84^{19}
3 251 897 108^{79}
3 285 987 25^{13}
3 397 124 34^{3}
3 402 210 40^{43}
213 18^{69}
3 405 169 46^{84}
171 120^{88}
550 84^{14}
3 407 147 78^{141}
208 54^{15}
3 408 298 73^{100}
351 78^{139}
3 409 678 39^{27}
685 18^{81}
686 18^{82}
3 410 919 19^{89}
921 18^{83}
3 412 050 65^{36}
168 25^{10}
3 413 341 38^{35}
342 26^{26}
357 39^{26}
374 19^{88}
3 414 630 14^{25}
3 415 667 77^{130}
3 417 149 42^{57}
157 18^{80}
3 418 379 44^{65}
389 14^{21}
402 77^{136}
3 420 878 26^{24}
3 422 157 44^{66}
3 423 472 45^{75}
3 425 852 77^{131}
3 426 358 135^{42}
3 427 240 76^{131}
3 428 640 147^{11}
641 148^{82}
689 27^{34}
701 18^{70}
3 429 942 18^{73}
3 431 266 145^{1}
3 432 508 53^{33}
3 433 812 28^{36}
849 13^{20}
3 434 873 161^{65}
3 436 429 37^{25}
432 108^{77}
433 110^{111}
434 110^{112}

3	437699	37^{26}	3	449443	139^{74}	3	458538	118^{11}
	705	109^{84}		452	119^{93}		589	106^{43}
	709	111^{117}		453	119^{94}	3	459812	133^{32}
	710	111^{118}		454	150^{96}		821	110^{100}
3	441497	159^{43}		455	109^{88}	3	462506	105^{39}
	569	165^{90}		456	111^{122}		508	105^{30}
3	442787	167^{103}	3	453139	167^{110}		509	105^{21}
	954	107^{63}		202	99^{33}		510	105^{29}
	958	131^{18}		332	132^{18}		511	105^{33}
	966	111^{116}		335	139^{73}	3	465055	105^{39}
3	444255	109^{82}	3	454532	161^{43}	3	466344	104^{14}
3	446639	167^{109}	3	455962	160^{58}		345	104^{15}
3	448156	122^{47}	3	456028	105^{38}		346	104^{16}